Model 2210



User Manual

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I2210.01 Rev. B

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Model 2210 Serial # ______________________

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Larson Davis, Inc.
Attn: Recycling Coordinator
1681 West 820 North
Provo, Utah, USA 84601

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CHAPTER

1 Introduction

Welcome to the Larson•Davis Model 2210. This 10-Channel, microphone signal conditioner/multiplexer allows for sound and vibration recording and measurement at Type 1 accuracy for the most precise credibility of data. The Model 2210 can be setup either manually, using the LCD display and the front key panel, or remotely using the RS-232 interface. We invite you to read this short manual to get the most out of your new Larson•Davis microphone signal conditioner/multiplexer.

About This Manual

This manual has 3 chapters and 2 appendices covering the following topics:

- *Chapter 1* - Introduction*:* overview of this user manual, formatting conventions, the Model 2210's applications, features and instructions for getting started
- *Chapter 2* - Understanding the Model 2210*:* understanding the Model 2210 architecture and the front and rear panels.
- *Chapter 3* - Setting up the Model 2210*:* A simple tutorial detailing basic screen and menu options
- *Appendix A* - Specifications*:* listing of acoustic, electronic, environmental, and physical characteristics of the Model 2210
- *Appendix B* - RS-232 Remote control commands

About This Chapter

Specifically, this introductory chapter covers the following topics:

- Formatting Convention: explanation of the fonts and other formatting conventions used in this manual
- Applications: description of the various uses of the flexible Model 2210
- Features: overview of the Model 2210's functions and measurement capabilities
- Getting Started: instructions for unpacking, inspecting, and initially assembling the Model 2210.

Formatting Conventions

This manual uses the following formatting conventions:

Functions accessed by pressing a key on the Model 2210 panel are shown with an icon, for example:

Press the R [right arrow] key and then press E.

In step-by-step directions, the *process* (what you do) is shown in the right column, and the *rationale* (why you do it) with other cautions and comments are shown in the left column.

Especially important information is shown in italics, for example:

This 10-Channel, microphone signal conditioner/multiplexer allows for sound and vibration recording and mea-

surement at Type 1 accuracy for the most precise credibility of data.

Applications

The Larson Davis Model 2210 applications include:

- microphone signal conditioning and recording
- vibration conditioning and measurement
- multiplexer
- Computer Data Acquisition System

Features

The Larson•Davis Model 2210 meets the A, B & C weighting requirements of the American National Standards Institute (ANSI) S1.4-1983, and International Electrotechnical Commission (IEC) 651-1979, standards for *Type 1* accuracy and offers the following features:

- Adjustable gain to 42dB in 2 dB steps, selectable per channel
- Low-pass and high-pass filtering
- Weighting (A, B, & C), selectable per channel
- Battery powered
- Lightweight (2.7 kg = 6 lb) and portable [7cm x 25cm x 24.1cm (2.75″ x 10″ x 9.5″) H x W x D]
- Manual or remote setup capability
- LED overload lights for each channel; can be set to either instantaneous or latching mode
- Drives microphone cables up to lengths of approximately 1,000 feet

- Addressable RS-232 interface
- Daisy chaining capability
- Insert voltage calibration facility
- 10 7-pin LEMO inputs for use with Larson•Davis Model PRM902 microphone pre-amplifiers and compatibles
- 1 25-pin D output with a CBL067 cable (this cable has 10 BNC connectors)
- 2 External inputs (signal conditioning optional)
- Dual multiplexer outputs, permitting use of two input channels simultaneously
- EEPROM storage capability
- Adjustable carrying handle
- 2 year warranty (see warranty statement on the copyright page at the front of this manual)
- daisy chain capability
- RS232 Interface (see appendix B)

Model 2210 Components



Figure 1-1 ***Model 2210.*** The Model 2210 is a flexible microphone signal conditioner/multiplexer with manual and remote capabilities.

Getting Started

This section outlines the steps you need to follow when you first receive and unpack the Model 2210. The following topics are covered:

- Unpacking and Inspection
- Accessories and Optional Equipment
- Connecting Internal or External Power
- Environmental Considerations
- Data Retention

You will then be ready to use the Model 2210 for actual measurements (as described later in *Chapter 2* of this manual).

Unpacking and Inspection

Your Model 2210 has been shipped in protective packaging. Please verify the package contents with the following list (Accessories and Optional Equipment) and retain the shipping containers for safe shipment at a future date. Report any damage or shortage immediately to Larson•Davis, Inc. at (801)-375-0177.

If you have not already done so, please record your instrument's serial number (located on the bottom of the 2210) and the purchase date. You will be asked to give this information in any future communications you may have with Larson•Davis, Inc.

Accessories and Optional Equipment

The Model 2210 is delivered with the following *standard* accessories:

- Model 2210
- NiCd battery - a good NiCd battery should provide more than 6 hours of operation
- PSA004 DC Power Supply; 12 Vdc, 2 Amp 90-264 at 50-60 HZ
- CBL Output cable; 3 feet long 25-pin D connector to 10 X BNC female
- CBL045 RS-232 cable
- User manual (L•D part # I2210.01)

The following *optional* equipment is also available:

- Larson Davis air-condenser microphones, 1″, 1/2″, 1/4″; free-field and random
- Model PRM902 1/2″ microphone pre-amplifier with 7-pin LEMO connector

- ADP011 1/4″ microphone to 1/2″ pre-amplifier adapter
- PRA950 ICP accelerometer pre-amplifier
- ADP005 1/2″ microphone thread to BNC adapter for use with charge-coupled accelerometers
- ADP007 1/2″ microphone thread to microdot adapter for use with charge-coupled accelerometers
- EXAXXX microphone extension cable, 7-pin LEMO connectors both ends
- PSA013 External Battery Charger, powered by PSA004 DC Power Supply
- BAT007 spare NiCd rechargeable battery module
- PSA004 DC Power Supply, secondary unit for charging external battery modules while using primary unit to power 2210 or charge batteries already inside 2210
- CBL049 Automobile Power Cable to power 2210 from cigarette lighter
- CBL061 BNC to mini-plug for insert voltage calibration input (6 ft.)
- Spare fuses: 3A Larson•Davis 2415.0028 (Littlefuse 273-003) and 2A Larson•Davis 2415.0025 (Littlefuse 273-002)

Environmental Considerations

The Model 2210 Microphone Signal Conditioner/Multiplexer can be both used and stored in a wide range of temperature, free of moisture and non-condensing humidity conditions (see “Environmental” specifications in *Appendix A* of this manual). However, some common sense precautions should be taken. For example, allow the Model 2210 ample time to adjust to abrupt temperature changes. Condensation may form inside a cold Model 2210 if it is brought into a warm

room or vehicle and may persist long after the outside case has adjusted to the ambient temperature.

Also, temperatures inside closed vehicles can reach excessive levels. *Therefore, do not leave the instrument in direct sunlight in a vehicle.* A simple safeguard is to keep the instrument inside a sealed foam insulated case or bag with desiccant silica gel, available at photographic equipment stores.

Data Retention

The Model 2210 has an EEPROM data retention capability and will recall its previous state at power-up. Upon initial power-up the EEPROM will recall the factory set-up. (Refer to "Store" in Chapter 3 on EEPROM use.)

CHAPTER

2

Understanding the Model 2210

This chapter covers the main architecture and components of the Model 2210. In this chapter, the following is discussed:

- Understanding the Model 2210 front panel
- Understanding the Model 2210 rear panel

Understanding the Model 2210 Front Panel

The front panel of the Model 2210 contains of the following, each are then explained in greater detail:

- 5/8″ by 3 1/2″ (2 line) LCD display
- Keypad
- LED overload lights for each of the ten channel inputs
- Two LED overload lights for the two rear external inputs, (as seen in the following section)
- Ten channel inputs

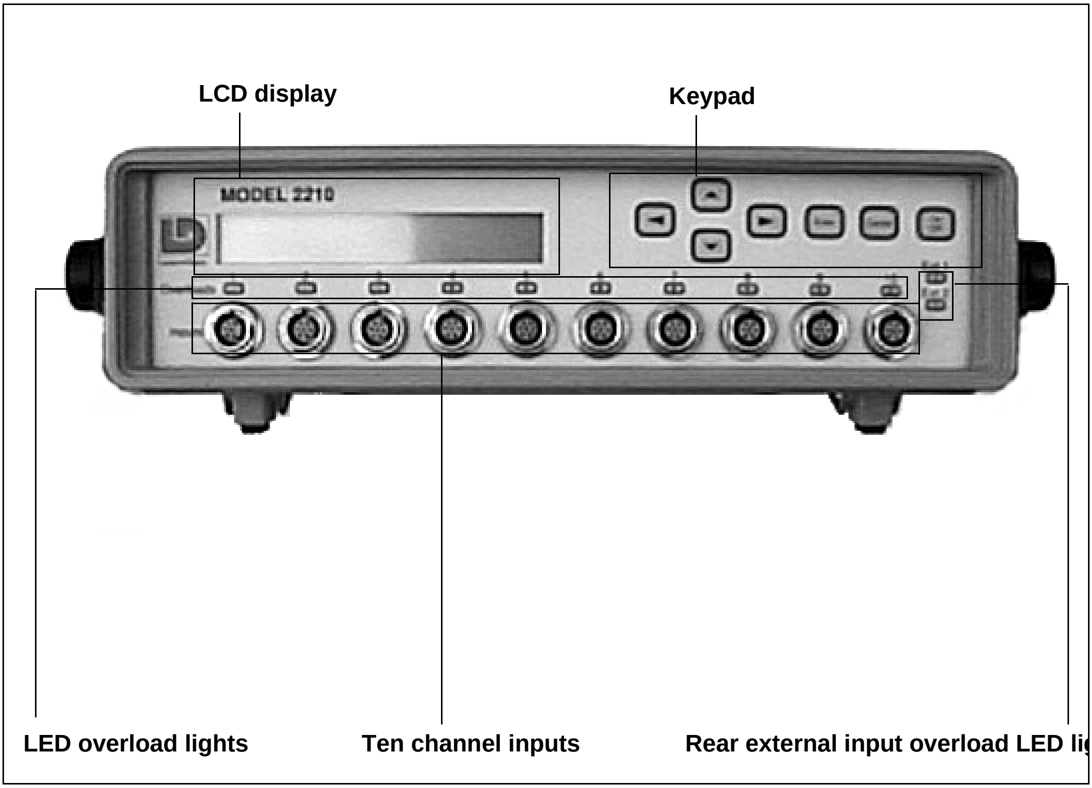
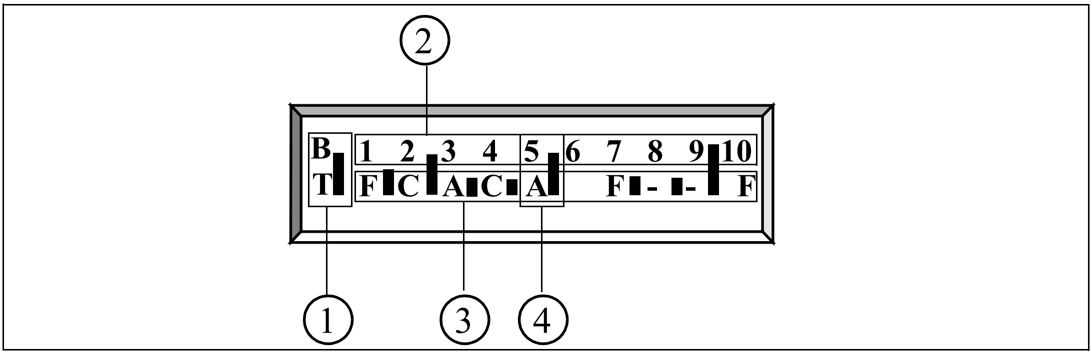


Figure 2-1 *Model 2210 Front Panel.*

LCD Display

The Model 2210 has a 5/8″ by 3 1/2″ (2 line) LCD display. This display is used to view channel settings and channel status. The following describes the Model 2210 default display:



1	Battery Power	B T with Bar - Battery power EX fc - External power, fast charge. EX tr - External power, trickle charge EX - External power, no charge
2	Channel	Channels 1-10 located on the front panel of the Model 2210.
3	Channel Filter Code	**A** - The slot has a full gain and weight filter card installed and the weight is set to "A-weight". **B** - The slot has a full gain and weight filter card installed and the weight is set to "B-weight". **C** - The slot has a full gain and weight filter card installed and the weight is set to "C-weight". **F** - The slot has a full gain and weight filter card installed and the weight is set to "Flat". **"-"** - The slot has an overload only card installed. No gain or weight is available for this channel. Blank - The slot does not have any card installed. This channel is not available and will not show a bar graph.
4	Sample of Channel 5	In this example, channel 5 is using the "A-weight" filter (indicated by the "A"), and is receiving a high signal (indicated by the bar).

Notes on Battery Power

The 2210 measures its battery's voltage, and then converts that voltage to time using a typical discharge curve for a 6 cell, 7.2 volt nickel cadmium battery (Larson•Davis part # BAT007).

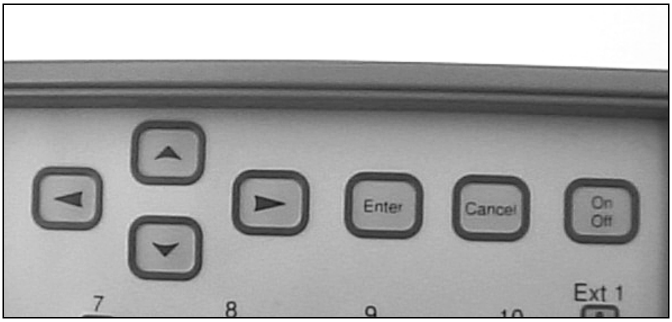
If the 2210 is operating from battery power, then the bargraph next to the "BT" will give a rough indication of the amount of time that the batteries can continue to power the 2210.

Since the battery gauge relies on the voltage of the battery pack, and nickel cadmium batteries tend to "rebound" after being discharged, the battery gauge can give misleading readings in some cases. For instance, if you completely run the batteries down and then shut the 2210 off for several hours, when you first turn it back on the battery gauge may show full time remaining. However the bar will quickly drop towards zero since the battery pack is actually quite empty. Usually this rebound effect will only power the 2210 for a few minutes before the battery is completely dead again. It is recommended to be sure to recharge the battery before a job.

If the battery is fully charged, the bargraph gives a fairly reliable indication of the portion of battery capacity remaining. The overall run time will vary depending on the length of microphone cables used, the type of pre-amps used, the number of channels in use and the frequency of the signals.

KeyPad

The Model 2210 has seven keys located on the front panel. These keys are used to power on/off the Model 2210, navigate through menus, and change settings.

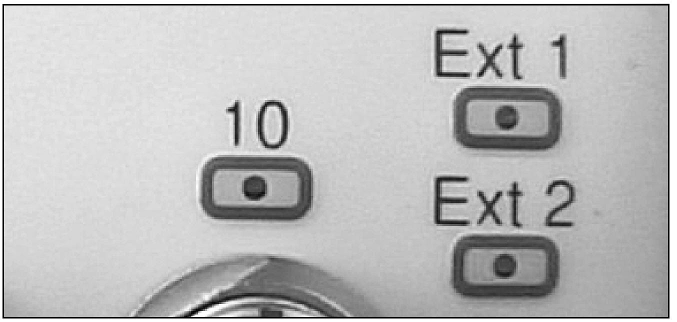


The seven front panel keys perform the following functions:

L	Selects the previous available screen or field
U	Modifies upward a screen or value
D	Modifies downward a screen or value.
R	Selects the next available screen or field
E	Accepts any changes made with the arrow keys
C	Discards any changes made with the arrow keys and returns to previous screen. When not using menus, the CANCEL key clears any overloads.
O	Manually powers up (turns on) or powers down (turns off) the Model 2210

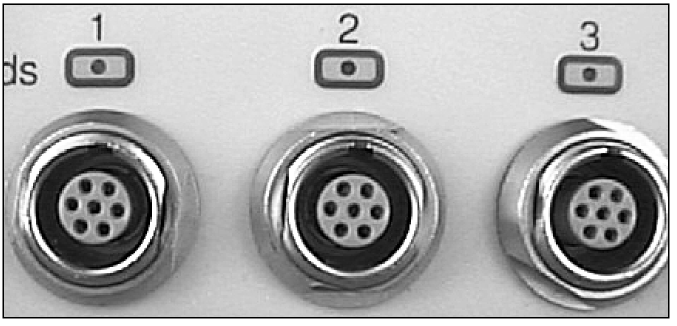
Overload Lights

The Model 2210 has 10 channel overload lights and 2 External input overload lights. These LED lights illuminate when a channel or external input reaches a overload state. The LED will remain lit until the overload state is automatically or manually reset (see Setting up the Model 2210 in chapter 3).



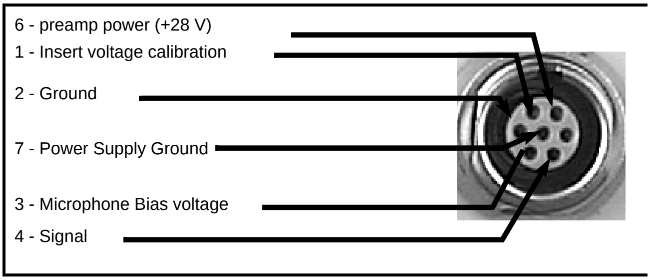
Ten Channel Inputs

The Model 2210 has 10 channel inputs located at the bottom of the front panel. The channels are designed for use with the Larson•Davis PRM902 preamplifier). Each channel input uses a standard Lemo 7-pin microphone connector.



Each of the channels may be conditioned by a filter and gain card that provides user selectable weighting and gain, as well as overload detection, or a pass-through card that only provides overload detection.

The firmware also recognizes if a channel has no card installed at all (see Setting up the Model 2210 in Chapter 3).



Understanding the Model 2210 Back Panel

The back panel of the Model 2210 contains of the following, each are then explained in greater detail:

- Internal NiCd battery pack compartment
- Insert Voltage Calibration
- Two external inputs
- Two multiplexer (MUX) outputs
- A 25-pin Signal output interface
- A RS-232 interface
- Fuses (one 2A and one 3A)
- An external power input

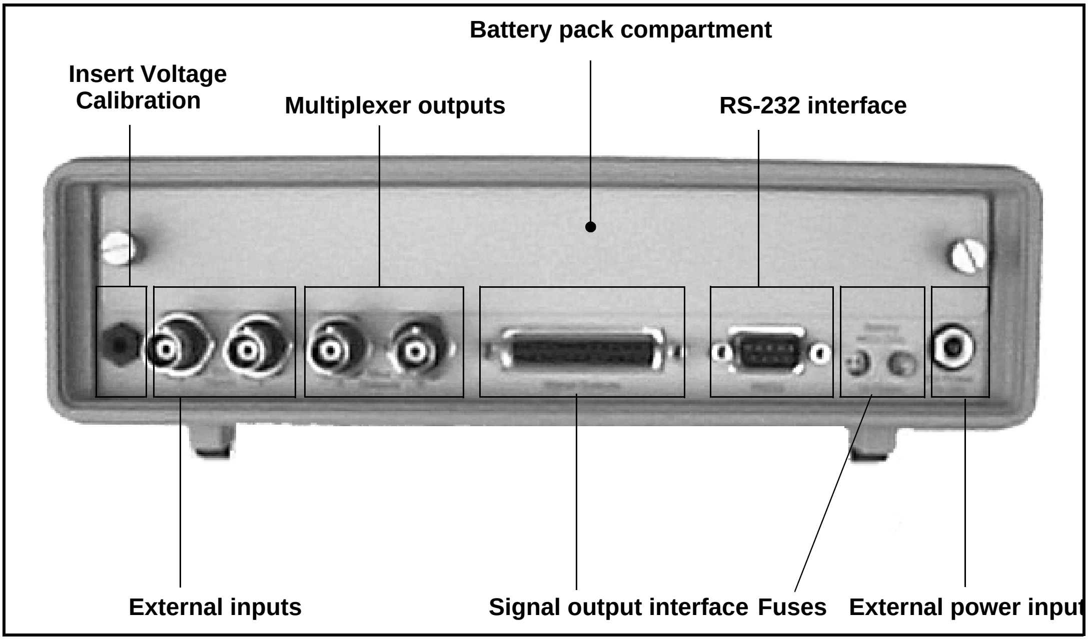


Figure 2-2 *Model 2210 Back Panel.*

Battery Pack Compartment

The Model 2210 can be powered by an internal NiCd battery pack or an external power supply. To insert the internal NiCd battery pack do the following:

Step 1 Unscrew (counterclockwise rotation) the two flat head-pin screws located on the upper plate of the rear panel.

Step 2 Once the pin-screws are unfastened, remove the rear metal battery plate.

Step 3 If a battery pack is already installed, gently pull on the black battery strap to remove battery pack from the battery compartment.

Replace only with a NiCd battery pack as the charger is set up for NiCd only.

Caution: Pay particular attention to the positive and negative poles on the battery. If the battery is inserted incorrectly, the battery fuse may blow.

Step 4 Place new NiCd battery pack in the battery compartment the metal leads towards the springs.

Step 5 Place rear metal battery plate over the battery compartment

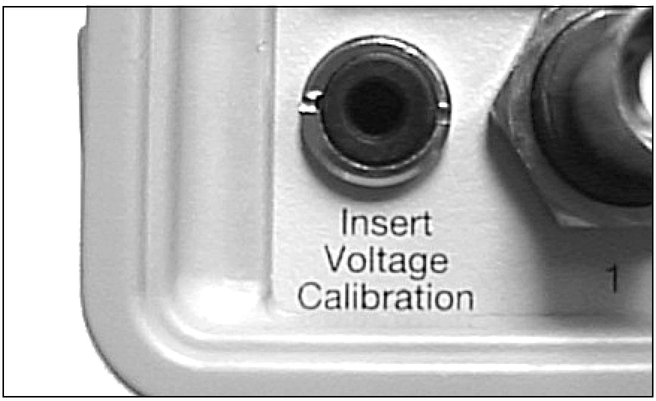
Step 6 Screw in and fasten the pin-screws in the holes of the battery plate to secure the battery compartment.

The internal battery life is approximately 6 hours.

Alternatively, you may use an external power source via the 11-16V external power connector. To do this, insert the PSA-004 power supply into the external power connector.

Insert Voltage Calibration

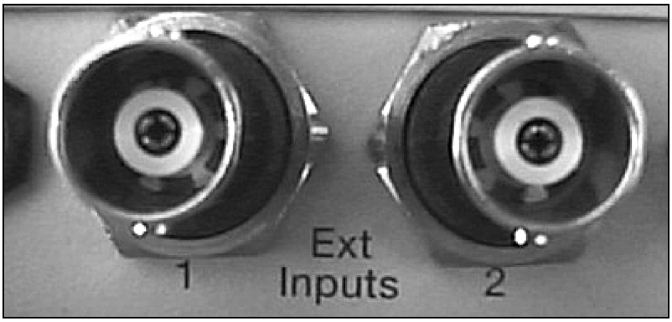
The Insert Voltage Calibration is used to send a test signal (with the optional CBL061 cable) to the pre-amp and microphone in order to verify the integrity of the system.



External Inputs

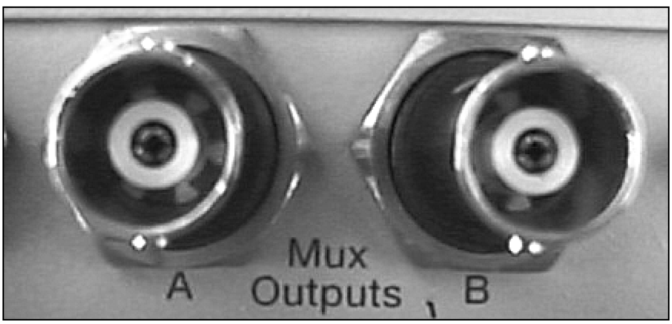
Overloads on either External Input 1 or External Input 2 will be displayed on the front panel.

There are also two "external" channels that normally contain no filter cards, but may be loaded with a standard filter and gain card. These two additional channels take their input from the back panel BNC connectors, and would normally be set to send their output to the Mux A and Mux B outputs. If the system is set up this way there is a maximum of 12 channels: 10 microphone input channels and 2 BNC input channels.



Multiplexer (MUX) outputs

The Model 2210 also has two additional BNC outputs, "Mux A" and "Mux B" that can be set by remote control or by the front panel. Either mux output can be set to any of the 10 microphone inputs or either of the two external inputs.

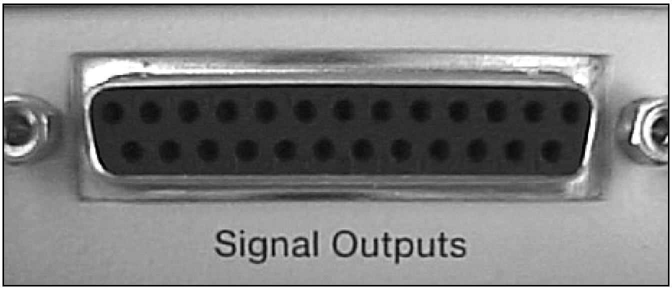


Using the external inputs and multiple 2210s allows expansion to a large number of channels.

Note: Automated scanning of the channels is not offered in the firmware. If you have an application that needs automated scanning, it can be accomplished by using the RS232 commands and a computer. (See Appendix B)

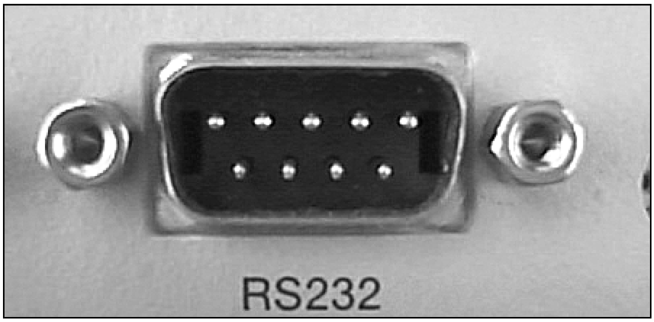
25-pin Signal Output Interface

The 25-pin signal output interface is used to connect the CBL067 cable from the Model 2210 to external devices (tape recorder, or other instruments). This cable splits the input signal from the 10 channels to 10 output BNC connectors.



RS-232 interface

The RS-232 connector is for use with external remote control of the Model 2210. Use the CBL045 cable to connect multiple 2210's on a single RS-232 computer port. (See Appendix B for addressing multiple 2210s.)



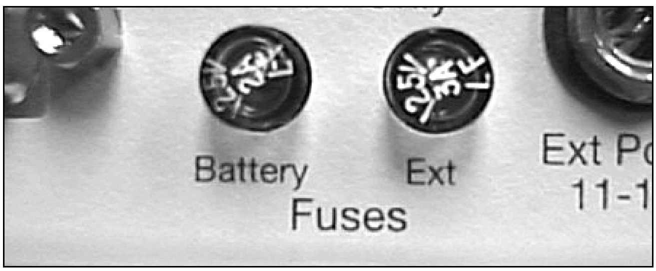
Fuses

See Chapter 1, "Accessories and Optional Equipment", page 1-7 for replacement part numbers.

The Model 2210 has one 2 Amp fuse for the battery and one 3 Amp fuse for external power supply located on the back panel. One fuse designated for the battery (LEFT), and the other is designated for the external power supply (RIGHT). Should one of these fuses need to be replace, do the following:

Step 1 Disconnect external power supply

Step 2 Remove fuse by pulling fuse straight out



Step 3 Replace defective fuse with a new fuse

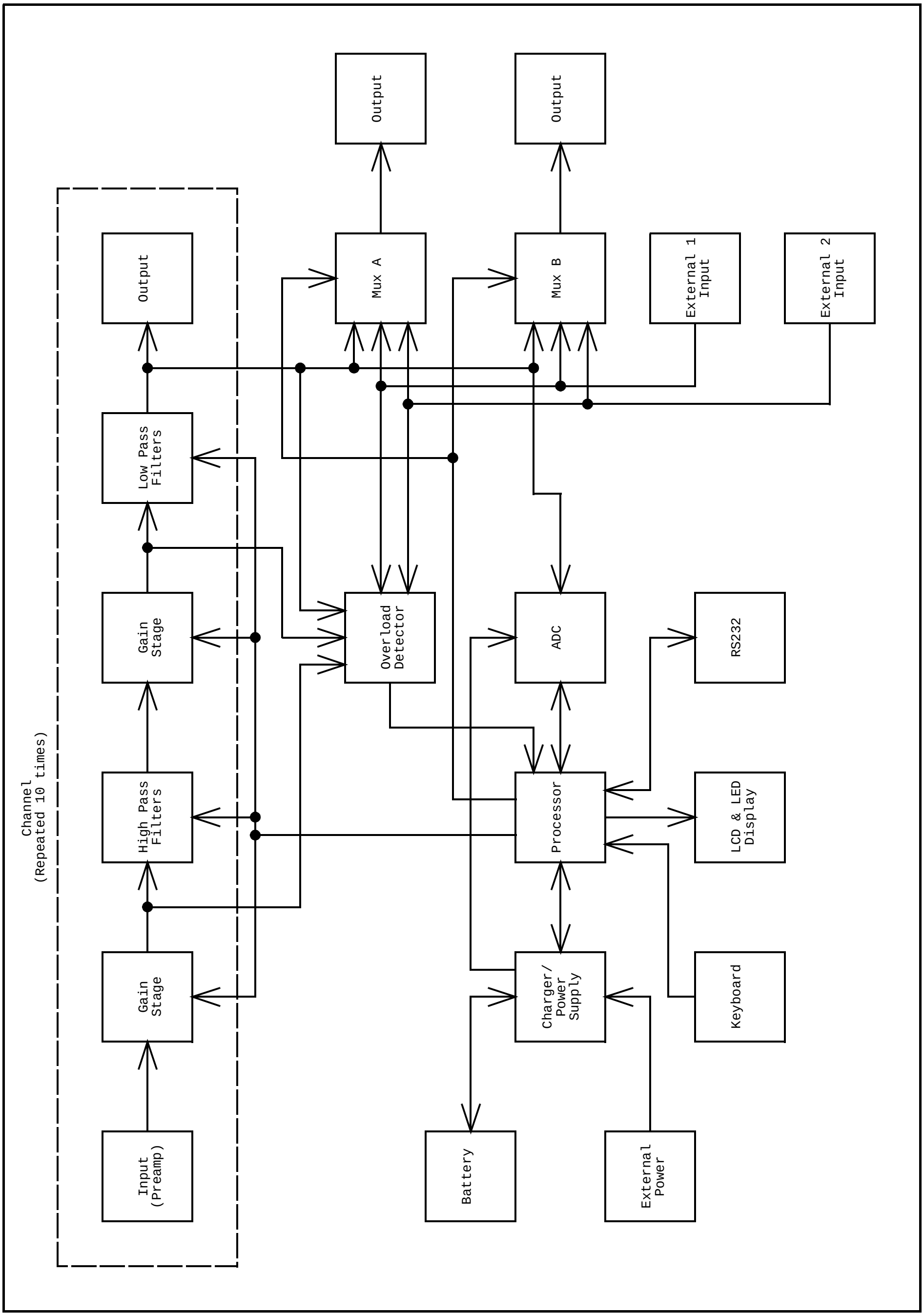
External Power Input

When external power is connected the battery will be charged even if 2210 is powered off.

The Model 2210 can be powered by the Larson•Davis power AC adaptor (PSA004), the optional CBL049 automobile power cable, or any 11-16 V external power supply providing at least 2.0 Amps.



Figure 2-3 ***2210 Block Diagram***



CHAPTER

3 Setting up the Model 2210

Once your Model 2210 is unpacked and connected to a battery (or external power supply), you can turn it on and perform sound and vibration recording and measurements. In this chapter, the following is discussed:

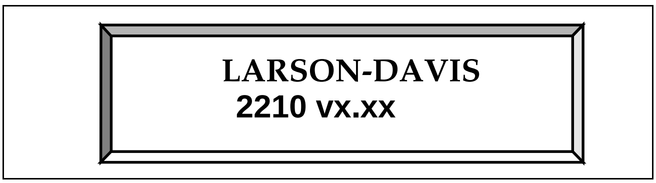
- Turning on the Model 2210
- Using menu items
- Turning off the Model 2210

Turning on the Model 2210

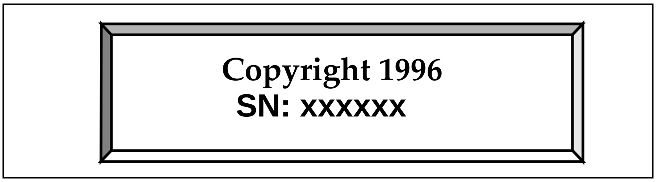
To power up the Model 2210, do the following:

Step 1 Press the O key, located on the front panel.

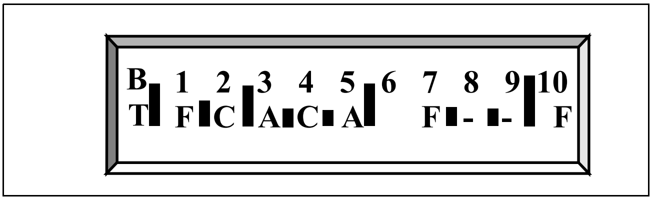
Step 2 The following power up screen appears for about 3 second, displaying the current firmware version



Step 3 The second power up screen then appears for about 3 second, displaying the serial number.



Step 4 The default screen then appears. The 2210 has an EEPROM and will recall its previous state at power-up. See chapter 2 LCD Display for description of default display.

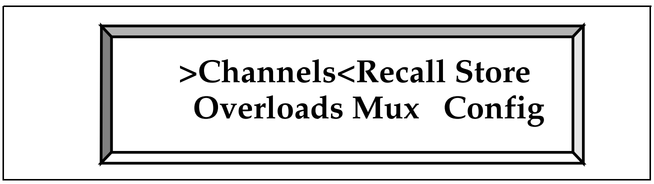


Using Menu Items

Once the Model 2210 is powered up, the settings menus can be accessed. To access menu items, do the following:

Step 1 Press the E key on the keypad. The following screen appears.

2210s with no filter cards installed will not display the “channels” menu item.



The animated ‘>’ and ‘<‘ indicate that only the RIGHT and LEFT arrow keys can be used.

Step 2 Use the R or L arrow keys to move from one menu item to the next.

Pressing the CANCEL key will allow you to exit the current screen/ setting and move to the previous screen without making any changes

Step 3 Press the E key to edit the selected menu item.

The main settings menu has 6 menu items which are shown in the table below, then described in greater detail:

Menu Item	Settings	Detail of setting
Channels	Channel -	1 - 10 Ext 1 Ext 2 All.
	Gain -	0 - 42 in 2dB steps
	Weight-	A-Weight B-Weight C-Weight 1 Hz - 5, 10, 20, or 100 kHz 10 Hz - 5, 10, 20, or 100 kHz 20 Hz - 5, 10, 20, or 100 kHz

Recall	Recall Setup -	Default 1 - 8
Store	Store Setup -	1 - 8
Overloads	Overloads	Are Latching Reset after 2 seconds Reset after 5 seconds Reset after 10 seconds
Mux	Output A Source - Output B Source -	Off Ch 1 - 10 Ext 1 Ext 2 Off Ch 1 - 10 Ext 1 Ext 2
Config	Mic Bias - Baud - Addr -	Off 28v 200v 2400 9600 19200 57600 01 - 99

Channel

The Channel menu item allows you to change specific settings for each of the 10 channels (located on the front panel of the Model 2210, or the two External outputs located on the rear panel). The channel menu item has the following settings:

Only channels that have filter cards installed will appear in the list

Channel - This is the currently selected channel: 1 -10, Ext1, Ext2, or All. The gain and weight for each channel automatically appears when this field changes to a different channel.

The first slot that has a filter card installed is used as the 'master' when modifying values and the channel is set to 'All'. For instance, if a 2210 had no filter cards installed in slots 1 and 2, then channel 3's value would be copied to all the other channels when ▲ or ▼ is pressed on a '--' field.

If "All" is selected and some items are not the same for all the channels, then those items will display "--". For instance, if the gain for channel 1 is 10 and the gains for the other channels are 30, then when "All" is selected for the channel, "--" will show as the gain.

If you use the ▲ and ▼ keys to modify a field that shows '--', then the first ▲ or ▼ key will set all the other channel's values to channel 1's value and display that value, subsequent ▲ or ▼ keys will modify all the channels values.

Gain - This is the current gain setting for the selected channel. Gain can be set between 0 - 42 in 2dB increments.

Weight - This is the current weight setting for the selected channel. The Weight setting has the following possibilities:
A-Weight
B-Weight
C-Weight
1 Hz - 5, 10, 20, 100 kHz
10 Hz - 5, 10, 20, 100 kHz
20 Hz - 5, 10, 20, 100 kHz

Recall

The Recall menu item allows you to restore previous complete setups, or a original factor default setup. This menu item works with the Store menu item. The recall menu item has the following settings:

Default - Default factory setup which is 0db gain 20Hz to 20kHz flat, 5 second non-latching overloads, Mux A's output off, Mux B's output off, and the Mic bias voltage off.

1- 8 - The Recall menu item allows you to recall one of eight possible setups.

If a setup is recalled that has never been stored, it is identical to the factory default setup. The "Default" setup will always recall the factory default setup.

To recall a setup:

Step 1 Use the R or L arrow keys to select one of eight previously stored setups.

Step 2 Press the E key to recall that setup from EEPROM and make the current setup.

Store

The Store menu item allows you to store the current setup of the Model 2210, which can later be recalled. This menu item works with the Recall menu item. The store menu item has the following settings:

1- 8 - The Store menu item allows you to store the current setup of the Model 2210 into one of eight EEPROM storage locations. Stores gain, filter settings, overload settings, Mux A and B settings, and Mic Bias voltage.

To store the current Model 2210 setup:

Step 1 Use the R or L arrow keys to select one of eight EEPROM storage location.

Step 2 Press the E key to store the current setup to EEPROM.

Overloads

The Overload menu item allows you to tell the Model 2210 how to handle overloads. This menu item has the following settings:

The C *key may be used to clean the automatically resetting overloads early.*

Are Latching - When overload occurs, overload will not automatically be reset, but must be manually reset by pressing the C key.

Reset after 2 seconds - The overload will be reset 2 seconds after an overload occurs.

Reset after 5 seconds - The overload will be reset 5 seconds after an overload occurs.

Reset after 10 seconds - The overload will be reset 10 seconds after an overload occurs.

The Overload LED will flash to indicate a current overload. After the overload condition is cleared, the LED will cease flashing and turn solid until it is reset. It is reset by either pressing the C key or if one of the above options (2, 5, or 10 seconds) time periods has elapsed without a further overload.

Mux

The Mux menu item is used to specify the output of the Mux BNC connectors located on the back panel of the Model 2210. The Mux menu item has the following settings:

Output A Source - Specifies the source signal that is outputted through BNC connector *Mux A Output* (Ch1 - Ch10, Ext 1, or Ext 2, Off.)

Output B Source - Specifies the source signal that is outputted through BNC connector *Mux B Output*. (Ch1 - Ch10, Ext 1, or Ext 2, Off.)

Config

The Config menu item allows you to change other system items. This menu item has the following settings:

Mic Bias - Setting for the desired microphone polarization voltage (Off, 28v, 200v).

Baud - Speed of the RS-232 interface connection (2400, 9600, 19,200, 57,600).

Addr - Address of the RS-232 interface (valid range 1-99).

Turning off the Model 2210

The Model 2210 can be powered down at any time by pressing the O key on the keypad. Note that powering down the 2210, while you are still in a menu, will cause any changes you made to be lost. To accept any changes,press the E key prior to powering down.

The 2210 will shut its self off when it detects a low battery.

APPENDIX

A Model 2210 Specifications

Mechanical specifications

Model 2210 Dimensions

Width	10 inch (25cm)
Depth	9.5 inch (24.1 cm)
Height	2.75 inch (7 cm)
Weight	8.0 lb (3.6 kg)

Environmental Specifications

Operating temperature	13 to 122° F (-10 to 50° C)
Charger operating temperature	10 to 40° C for fast charge mode
Storage temperature	-13 to 158° F (-25 to 70° C)
Relative humidity	0 to 90%, non-condensing

Power

Internal NiCd	operating time - approximate 6 hours Charged internally using PSA004 DC Power Supply(included) or externally using PSA013 (not included) with PSA004
Time for complete recharge	3.5 hours
DC power	PSA004 DC power supply (11-16 Vdc, 2A) included
Connector	2.5mm (postive tip)

Inputs/Outputs

10 Microphone Inputs

Polarization	0, 28, 200 Vdc selectable for all channels	
Preamplifier supply	+28 V 0.1 Amps for all 10 channels	
Long cable lengths (full 5Vrms into preamp)	100k Hz 50 kHz 20 kHz 10 kHz	100’ 300’ 700’ 1000’
Connector	7-pin LEMO for use with Larson•Davis Model PRM902 microphone pre-amplifiers and compatible	
Input impedance	10 G ohm in parallel with 2 pF (with Larson•Davis PRM902 preamplifier)	

Overload threshold	±7.5 Peak
Max channel to channel Crosstalk	75 dB down with 120 dB signal in adjacent channel @ 100 kHz

Filters & Gains (selectable per channel)

Weighting	A, B, C satisfying ANSI S1.4 - 1983 and IEC 651-1979 Type 1
High pass filters	Flat above 1, 10, or 20 Hz (third order Chebychev)
Low pass filters	Flat up to 5, 10, 20, (third order Chebyshev) or 100K Hz (second order Butterworth)
Gain	± .3 dB in 2 dB increments, selectable per channel

2 External Inputs

Connector	BNC
Overload threshold	±7.5 Peak

Insert Voltage Calibration Input

Connector	3.5 mm (signal tip)

10 Microphone Outputs

Connector	25 pin D to harness of 10 cables with BNC connectors (CBL067)
Output impedance	50ohm

Max output voltage offset	±.14 V

2 Multiplexer Outputs

Connectors	BNC
Output impedance	50 ohm
Max output voltage offset	±.14 V

Digital Control

Connector	RS-232

Typical Noise Floor (referenced input)

Gain (dB)	Sum (20 Hz - 20 kHz, dBμV)	A-Weighting (dBμV)
40	6	3
30	6	3
20	8	5
10	13	10
0	22	19

Microphones

The Larson•Davis Model PRM902 microphone pre-amplifiers is used with Larson Davis 1″, 1/2″, and 1/4″ condenser microphones. When using 1″ or 1/4″ microphones, the adaptors ADP011 or ADP008, respectively, are required. The Larson•Davis Model PRM900C can also be used in conjunction with the

CBL079 7-pin-LEMO-to-5-pin Switchcraft cable adaptor.

Accelerometers

When using ICP accelerometers, a Larson•Davis Model PRA950 ICP accelerometer pre-amplifier at the outboard end of a microphone extension cable (CBL079) will provide the DC current (2-4 mA) required to power the accelerometer.

When using charge-coupled accelerometers, the Larson•Davis Model PRM902 microphone pre-amplifier at the outboard end of the microphone extension cable will provide sufficient input impedance. Use the adaptor ADP005 in place of the microphone for use with BNC connectors and the ADP007 for use with micro-dot connectors.

B Remote Control Commands

The 2210 supports 2400, 9600, 19200, and 57600 baud rates, always at no parity, eight data bits, and one stop bit. Because the 2210's are addressable and can be daisy chained together the must be used with the LDL cable CBL045.

The 2210 supports the following three address states:

0	Disabled. All RS232 traffic is ignored except address change commands.
1	Accepting commands and executing them, but not returning responses.
2	Accepting commands and responding normally.

The 2210 always powers up in state 2, accepting commands and responding to them. Any bytes that have bit 7 set (128 - 255) are considered address change commands.

Address 0 (128): BROADCAST RECEIVE MODE

If this 2210's address is 1, then this 2210 is set to state 2. If its address is any other value, then this 2210 is set to state 1.

Address 1 to 99 (129 - 227): ADDRESS INDIVIDUAL UNIT

If this 2210's address is the specified address, then this 2210 is set to state 2. If its address is any other value, then this 2210 is set to state 0.

Address 100 to 126 (228 - 254): INVALID, RESERVED

These are invalid. All 2210's will enter state 0.

Address 127 (255): ENABLE ALL

All 2210's will enter state 2. This command can cause trouble if there are multiple 2210's connected.

Excluding the address bytes above, all data sent over the serial connection when any 2210 is listening (in state 1 or 2) should follow this general format.

Host to slave command/request packet.	
Command Group	BYTE
Command Index	BYTE
<data area>	BYTE ARRAY defined by each command
Checksum	BYTE (if turned on)
CR	BYTE
LF	BYTE (Optional)

Slave to host packet/acknowledge definition.	
Responding to Command Group	BYTE
Responding to Command Index	BYTE
<data area>	defined by each command

Checksum	BYTE (if turned on)
CR	BYTE

Any 2210 that is accepting commands and responding (state 2) will always respond to every valid packet that it receives. If a 2210 is accepting commands but not responding (state 1) then it will only execute valid packets. Once the 2210 has at least 3 bytes and receives a CR, then it adds up the checksum and compares it with the one that was sent with the packet. If the checksum is valid the 2210 continues to parse the command checking for valid command group, command index, and valid data area (if this command has any data area). If any errors are encountered they are set in the 2210's internal error flags. These flags may be queried after every command or group of commands to make sure that those commands did not generate any errors.

The checksum is calculated by adding the command group, Command index, and any bytes in the data area in an 8-bit register, discarding overflows. Once the characters are added up, the result is truncated to 7-bits, and then moved out of the control character region of the ASCII table [if(checksum<0x20)checksum+=0x40].

The 2210 powers up with checksums required. To turn off checksums send two CR's. To turn the checksums back on send two CR's, an M1 command or power cycle the unit. Sending two CR's will return the string"<CR><CR>Larson-Davis Model 2210 <CK><CR>."

The 2210 recognizes the backspace (0x8). Care must be used when using the backspace because the 2210 will backspace into previous RS232 commands.

If the 2210 is off, any activity on the serial port will turn it on. Here is a list of the RS232 commands and their syntax.

Power On/Off Commands

M1 Command

M1<CK><CR> Turns the 2210 on

Will reset unit if unit is already powered (turned on). Clears RS232 communication errors, clears latched overloads, clears remote overloads, and enables RS232 checksums.

Returns “M1 <CK><CR>”

If the command is ignored because there is too much data then just the group and modified index will be returned and the “invalid Data_Areas” flag will be set: M0 <CK><CR>.

M2 Command

M2<CK><CR> Turn the 2210 off

Returns "M2<CK><CR>"

If the command is ignored because there is too much data then just the group and modified index will be returned and the “invalid Data_Areas” flag will be set: M0 <CK><CR>.

Condition Commands

C1 Command

C1<CK><CR> Read and clear communication errors

Returns "C1digconfb<CK><CR>":

C1digconfb<CK><CR>		
	Returns	Comments
d	1	any invalid Data_Areas has been received
	0	only valid Data_Areas has been received
i	1	invalid Command_Indices have been received
	0	only valid Command_Indices have been received
g	1	any invalid Command_Groups have been received
	0	only valid Command_Groups have been received
c	1	corrupt packets received (partial packets, incorrect checksums, any kind of garbage)
	0	only complete packets have been received
o	1	there has been noise on the receive data line
	0	normal
n	1	any invalid Command_Groups have been received
	0	normal
f	1	the receive register has had a framing error
	0	normal
b	1	the firmware input buffer has overflowed (probably means that the host is not waiting for acknowledge packets)
	0	normal

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: C1 <CK><CR>.

C2 Command

C2<CK><CR> Read and clear remote access overloads

Returns "C2oooooooooooo<CK><CR>"

C2oooooooooooo<CK><CR>	
C2	
o	Channel 1
o	Channel 2
o	Channel 3
o	Channel 4
o	Channel 5
o	Channel 6
o	Channel 7
o	Channel 8
o	Channel 9
o	Channel 10
o	External 1
o	External 2
<CK>	
<CR>	

Where 'o' is:

'0' if the channel has not been overloaded

'1' if the channel has been overloaded but is not now

'2' if the channel is overloaded now

C2 will return the state of a latching overload status variable that can only be reset by this command or the M1 command. The variable is cleared when the unit is powered up. Any overloads are latched into this variable. The only way to clear it is by using this C2 command or the M1 command. This variable is always latching and does not time out like the front-panel indicator will. This variable is not reset by pressing the front-panel "cancel" key.

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: C2 <CK><CR>.

C3 Command

C3<CK><CR> Read and clear front-panel overloads

Returns "C3oooooooooooo<CK><CR>"

C3	
o	Channel 1
o	Channel 2
o	Channel 3
o	Channel 4
o	Channel 5
o	Channel 6
o	Channel 7
o	Channel 8

o	Channel 9
o	Channel 10
o	External 1
o	External 2
<CK>	
<CR>	

Where 'o' is:

'0' if the channel's overload LED is off

'1' if the channel's overload LED is on continuously

'2' if the channel's overload led is blinking

C3 will return the status of the front panel overload LEDs, and clear any overloads. It is possible to miss transient overloads if this command is the only command used to read the overloads. Use this command to find out status about the front panel display. Use C2 to assure that no transient overloads are missed.

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: C3 <CK><CR>.

Read Commands

R1 Command

R1<CK><CR> Read Manufacturer/Model

Returns "R1Larson-Davis Model 2210<CK><CR>"

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: R1 <CK><CR>.

R2 Command

R2<CK><CR> Read firmware version and Serial Number

Returns "R2v.vv nnnnnn<CK><CR>"

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: R2 <CK><CR>.

R3 Command

R3<CK><CR> Read card status

Returns "R3ssssssssssss<CK><CR>"

R3ssssssssssss<CK><CR>	
R3	
s	Channel 1
s	Channel 2
s	Channel 3
s	Channel 4
s	Channel 5
s	Channel 6
s	Channel 7
s	Channel 8

s	Channel 9
s	Channel 10
s	External 1
s	External 2
<CK>	
<CR>	

Where each s represents the status of the corresponding slot:

F = full filter card

B = buffer only card

- = empty slot

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: R3 <CK><CR>.

R4 Command

R4<CK><CR> Read Gain Settings

Returns
"R4GgGgGgGgGgGgGgGgGgGgGgGg<CK><CR>"

R4GgGgGgGgGgGgGgGgGgGgGgGg<CK><CR>	
R4	
Gg	Channel 1
Gg	Channel 2
Gg	Channel 3

Gg	Channel 4
Gg	Channel 5
Gg	Channel 6
Gg	Channel 7
Gg	Channel 8
Gg	Channel 9
Gg	Channel 10
Gg	External 1
Gg	External 2
<CK>	
<CR>	

Where Gg is "00" to "42" meaning 0 to 42 dB gain for the given channel. Only slots that have a full filter card installed ('F' returned by R4) will return meaningful data. Other slots return “--”.

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: R4 <CK><CR>.

R5 Command

R5<CK><CR> Read high pass filters

Returns "R5hhhhhhhhhhh<CK><CR>"

R5hhhhhhhhhhh<CK><CR>	
R5	
h	Channel 1 high pass code

h	Channel 2 high pass code
h	Channel 3 high pass code
h	Channel 4 high pass code
h	Channel 5 high pass code
h	Channel 6 high pass code
h	Channel 7 high pass code
h	Channel 8 high pass code
h	Channel 9 high pass code
h	Channel 10 high pass code
h	External 1 high pass code
h	External 2 high pass code
<CK>	
<CR>	

Where h is the high pass state for the given channel:

High pass 0 = A-Weight

High pass 1 = B-Weight

High pass 2 = C-Weight

High pass 3 = 1Hz

High pass 4 = 10Hz

High pass 5 = 20Hz

Only slots that have a full filter card installed ('F' returned by R4) will return meaningful data. Other slots return "-".

If the command is ignored because there is too much data then just the group and index will be returned

and the “invalid Data_Areas” flag will be set: R5 <CK><CR>.

R6 Command

R6<CK><CR> Read low pass filters

Returns "R6llllllllllll<CK><CR>"

R6llllllllllll<CK><CR>	
R6	
l	Channel 1 low pass code
l	Channel 2 low pass code
l	Channel 3 low pass code
l	Channel 4 low pass code
l	Channel 5 low pass code
l	Channel 6 low pass code
l	Channel 7 low pass code
l	Channel 8 low pass code
l	Channel 9 low pass code
l	Channel 10 low pass code
l	External 1 low pass code
l	External 2 low pass code
<CK>	
<CR>	

Where l is the low pass state for the given channel:

Low pass '0' = 5KHz

Low pass '1' = 10KHz

Low pass '2' = 20KHz

Low pass '3' = 100KHz

Only slots that have a full filter card installed ('F' returned by R4) and that do not have their high pass filter set to A-weight, B-weight, or C-weight will return meaningful data. If the high pass is A, B, or C for a card then the low pass is not used for that card. Other slots return “-”.

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: R6 <CK><CR>.

R7 Command

R7<CK><CR> Read mux sources

Returns "R7AaBb<CK><CR>"

where

Aa	Output A source
Bb	Output B source

R7AaBb<CK><CR>		
Aa Output	Bb Output	Output source
00	00	Off
01	01	Ch 1
02	02	Ch 2
03	03	Ch 3

04	04	Ch 4
05	05	Ch 5
06	06	Ch 6
07	07	Ch 7
08	08	Ch 8
09	09	Ch 9
10	10	Ch 10
11	11	Ext 1
12	12	Ext 2

If the command is ignored because there is too much data then just the group and index will be returned and the “invalid Data_Areas” flag will be set: R7 <CK><CR>.

R8 Command

R8<CK><CR> Read Power Supply Status

Returns "R8mscuu<CK><CR>"

R8mscuu<CK><CR>			
m mic bias voltage		0	Off or 0 V
		1	28 V
		2	200 V
s	power source	X	external power
		B	battery

c	charging status	F	fast charge
		T	trickle charge
		-	no charging (either no battery installed or no external source attached.)
uu	percent of battery life remaining*	--	external power
		00 to 99	percent of battery life remaining

*Where uu is the amount of usable time/charge that is left in the battery, expressed in percent. This value is calculated from linearizing the battery voltage over a typical discharge cycle with respect to time. This reading will correspond to the "BT" bargraph on the display. Neither of these battery capacity readings are perfect. They will vary with battery age, temperature, and the battery's history of charge and discharge cycles. If the current power source is external, this field will return "--".

If the command is ignored because there is too much data then just the group and index will be returned and the "invalid Data_Areas" flag will be set: R8 <CK><CR>.

Set Commands

NOTE: None of the "S" commands update the power-up default EEPROM register. This register is automatically updated whenever the user uses enter from the front panel to accept the modifications they have made. If you want the 2210 to power up with whatever the current state is, issue an "S60<ck><cr>" after making your modifications.

S1 Command

S1GgGgGgGgGgGgGgGgGgGgGgGg<CK><CR>
Set Gains

S1GgGgGgGgGgGgGgGgGgGgGgGg<CK><CR>	
S1	
Gg	Channel 1
Gg	Channel 2
Gg	Channel 3
Gg	Channel 4
Gg	Channel 5
Gg	Channel 6
Gg	Channel 7
Gg	Channel 8
Gg	Channel 9
Gg	Channel 10
Gg	External 1
Gg	External 2
<CK>	
<CR>	

Where Gg is "00" to "42" meaning 0 to 42 dB gain for the given channel. Odd numbers or out-of range numbers will give "invalid Data_Areas" error. You must supply data for all 12 slots, including slots that do not have a filter card installed (R4 returned 'B' or '-'). The data for those slots still must be valid ("00" will always work) even though it will be ignored. If the command

is executed then the complete command will be returned:

S1GgGgGgGgGgGgGgGgGgGgGgGg<CK><CR>

If the command is ignored because there is too much or too little data, or the data for one of the channels is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S1<CK><CR>

S2 Command

S2hhhhhhhhhhhh<CK><CR> Set high pass filters

S2hhhhhhhhhhhh<CK><CR>	
S2	
h	Channel 1 high pass code
h	Channel 2 high pass code
h	Channel 3 high pass code
h	Channel 4 high pass code
h	Channel 5 high pass code
h	Channel 6 high pass code
h	Channel 7 high pass code
h	Channel 8 high pass code
h	Channel 9 high pass code
h	Channel 10 high pass code
h	External 1 high pass code
h	External 2 high pass code
<CK>	

<CR>	

Where h is the high pass state for the given channel:

High pass 0 = A-Weight

High pass 1 = B-Weight

High pass 2 = C-Weight

High pass 3 = 1Hz

High pass 4 = 10Hz

High pass 5 = 20Hz

Out-of range numbers will give "invalid Data_Areas" error. You must supply data for all 12 slots, including slots that do not have a filter card installed (R4 returned 'B' or '-'). The data for those slots still must be valid ("0" will always work) even though it will be ignored. If the command is executed then the complete command will be returned:

S2hhhhhhhhhhhh<CK><CR>

If the command is ignored because there is too much or too little data, or one of the values is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S2<CK><CR>

S3 Command

S3llllllllllll<CK><CR> Set low pass filters

S3llllllllllll<CK><CR>	
S3	
l	Channel 1 low pass code

l	Channel 2 low pass code
l	Channel 3 low pass code
l	Channel 4 low pass code
l	Channel 5 low pass code
l	Channel 6 low pass code
l	Channel 7 low pass code
l	Channel 8 low pass code
l	Channel 9 low pass code
l	Channel 10 low pass code
l	External 1 low pass code
l	External 2 low pass code
<CK>	
<CR>	

Where l is the low pass state for the given channel, only significant if the high pass for this channel is not A-weight, B-weight or C-weight:

Low pass '0' = 5KHz

Low pass '1' = 10KHz

Low pass '2' = 20KHz

Low pass '3' = 100KHz

Out-of range numbers will give "invalid Data_Areas" error. You must supply data for all 12 slots, including slots that do not have a filter card installed (R4 returned 'B' or '-'). The data for those slots still must be valid ("0" will always work) even though it will be

ignored. If the command is executed then the complete command will be returned:

S3llllllllllll<CK><CR>

If the command is ignored because there is too much or too little data, or one of the values is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S3<CK><CR>

S4 Command

S4AaBb<CK><CR> Set mux sources

where

Aa	Output A source
Bb	Output B source

S4AaBb<CK><CR>		
Aa Output	Bb Output	Output source
00	00	Off
01	01	Ch 1
02	02	Ch 2
03	03	Ch 3
04	04	Ch 4
05	05	Ch 5
06	06	Ch 6
07	07	Ch 7
08	08	Ch 8

09	09	Ch 9
10	10	Ch 10
11	11	Ext 1
12	12	Ext 2

Out-of range numbers will give "invalid Data_Areas" error. You must supply data for both mux sources. If the command is executed then the complete command will be returned:

S4AaBb<CK><CR>

If the command is ignored because there is too much or too little data, or one of the values is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S4<CK><CR>

S5 Command

S5v<CK><CR> Set mic bias.

Set mic bias to value v. 0-2 are valid.

Where:

v	mic bias voltage	0	off or 0 V
		1	28 V
		2	200 V

Out-of range numbers will give "invalid Data_Areas" error.

If the command is executed then the complete command will be returned:

S5v<CK><CR>

If the command is ignored because there was too much or too little data or the value is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S5<CK><CR>

S6 Command

S6r<CK><CR> Store current setting in EEPROM register.

Store current settings in eeprom register r. 0-9 are valid.

Where:

Register	
0	power-up default register, also changed by the user through the menu.
1-8	User setups
9	Remote only setup (Just like a user setup, but cannot be accessed by the user through the menu.)
>9	Out-of range numbers will give "invalid Data_Areas" error.

If the command is executed then the complete command will be returned:

S6r<CK><CR>

If the command is ignored because there was too much or too little data or the value is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S6<CK><CR>

S7 Command

S7r<CK><CR> Recall EEPROM register to current settings.

Recall eeprom register r into the current settings.

Where:

Register	
0	power-up default register, also changed by the user through the menu
1-8	User setups
9	Remote only setup (Just like a user setup, but cannot be accessed by the user through the menu.)
F	Factory default
>9	Out-of range numbers will give "invalid Data_Areas" error.

If the command is executed then the complete command will be returned:

S7r<CK><CR>

If the command is ignored because there was too much or too little data or the value is out of range, then just the group and index will be returned and the "invalid Data_Areas" flag will be set:

S7<CK><CR>

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